Chair of Carbon Composites
TUM School of Engineering and Design
Technical University of Munich

Bachelor's Thesis, Term Project, Master's Thesis

Material Characterization of Novel Hybrid Composites

Additive Manufacturing by Material Extrusion– also known as 3D printing – uses thermoplastic polymers to create complex structures layer by layer. Automated Fibre Placement places tapes of continuous fibres according to a given path. The project at the chair will combine these two composite manufacturing technologies into an Advanced Tape Layer Additive Manufacturing (ATLAM) process. By the integration of continuous fibres, it is possible to achieve identical coefficients of thermal expansion as traditional composite parts possess. The ATLAM process will enable aerospace manufacturers to generate composite tools quick and cheap compared to the current state. Specifically, for the current project, landing flaps for an Airbus passenger aircraft shall be manufactured with the produced tools. The long-term goal is to manufacture flying structural parts for the aerospace industry.

The newly developed material combination of the short fibre reinforced material and the continuous tape needs to be investigated for mechanical performance. Therefore, it is necessary to obtain Young's modulus, compressive strength and creep behaviour for the hybrid composite. The first work package will be a literature research on suitable test methods followed by the generation of a Design of Experiments (DoE). The DoE should be kept as small as necessary to keep the workload manageable. Finally, the specimen will be printed with the ATLAM-printhead on an industrial robot and investigated in the composite testing lab. Depending on the type and focus of the thesis, the work packages will be adapted.

Research focus of the thesis

- Literature research: Suitable test procedures for the hybrid composite
- Set up a Design of Experiments
- Specimen printing and testing
- Documentation

Requirements

- Clean and independent way of working
- Interest in material testing and composites
- Basic knowledge in test standards of composites is an advantage

Figure 1: 3D printed test cube

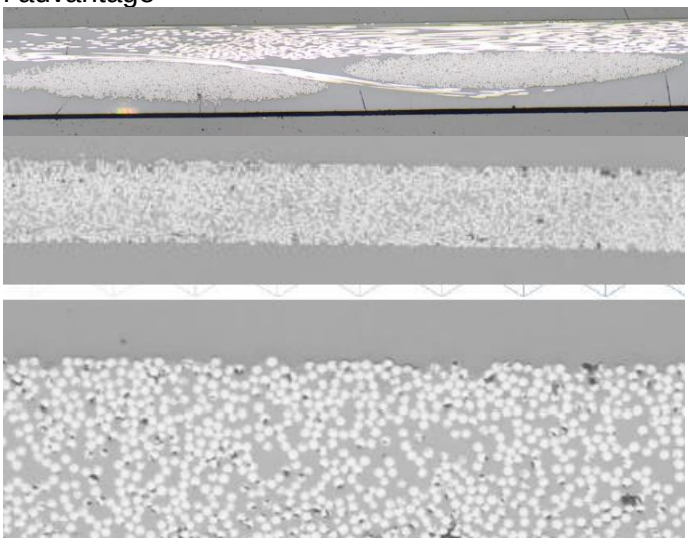

Figure 2**:** Microscopic image of the fiber distribution in the tapes between the 3D printed layers

Starting date: Now, flexible

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